ACS AD

Attitude Control System

User's manual

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Mente Marine
For the right attitude!

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Introduction

This user's manual describes the installation and usage of the ACS AD attitude control system from Mente Marine.

Symbols and abbreviations

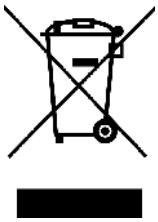
ACS	Attitude Control System
LED	Light Emitting Diode

Security

Switch off the main circuit breaker or put the ACS into manual mode before lifting or transporting the boat. Should the automatics engage during transport, the trim tabs may be damaged.

The control unit is protected against moisture and water spray, according to class IP66. Do not install it in a place where it may become completely wet!

Product disposal



The WEEE Directive requires the recycling of waste electrical and electronic equipment.

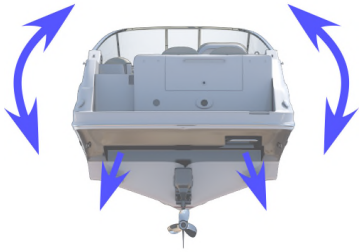
Theory of operation

The deep-V hulls of modern pleasure boats are designed to provide you with a smooth ride in rough water. The deeper the V, the more need for trim tabs to keep the boat levelled. A roll or sideward's inclination is dependent on the wind and passenger location. The longitudinal inclination, also called the trim angle, depends on the speed and loading. When the course is changed, winds change direction and you need to trim the boat. When passengers move, trim again. This need, to constantly adjust the trim tabs, takes the driver's attention, which can even be a safety risk during high-speed operations.

ACS takes care of the work for you. When changing course, winds shift, or passengers move, the attitude of the boat is automatically corrected by adjusting the trim tabs.

Roll and pitch axes

ACS AD automatically adjusts the boat to the optimum attitude in the roll axis, eliminating heeling.



ACS AD automatically adjusts the boat to the optimum attitude in the pitch axis, improving visibility and also enabling speeds in the "semi-planing" range. It also improves the "hole shot".

Turning detection

While making a turn, the boat leans inwards. Thanks to the built-in gyros, the system is able to detect heading changes and prevent automatic corrections while turning. Unnecessary adjusting is avoided and the boat exits the turn with the optimum attitude.

The AUTO indicator blinks while making the turn to indicate that the ACS is blocked and not active at that moment.

Once set up on a steady course again, the ACS continues measuring and correcting the attitude, taking the altered conditions into account.

Adaptive system

ACS adapts to boats over the whole range. Thanks to the adaptive functionality, the boat is set up to the optimum running attitude, taking into account differences in size and trim tab performance.

It also adapts to varying sea conditions. In calm seas, a list condition is corrected faster than in rough seas. This allows a quick reaction when needed and avoids unnecessary operations that could amplify a roll in high waves.

Off the plane

When slowing down, below planing speed, trim tabs lose their effect. ACS is aware of this and does not attempt to control the attitude while off the plane. When accelerating, the ACS automatically starts up, correcting the attitude back to that which is desired, even before the boat “breaks over” and reaches the cruising speed.

The AUTO indicator blinks while off the plane. The blinking indicates that the automatic operation is activated, but suspended for the time being because of the slow speed.

Position estimation

ACS shows the trim tab position estimation by lighting an indicator LED for each trim tab. When a tab is extended, the lit up indicator LED moves downwards. No additional sensors are needed and ACS shows the trim tab position estimation for all types of trim tabs after calibration.

Light sensor (Optimum visibility day and night)

Auto button with indicator (Auto / Manual mode)

4 x buttons for manual control of the trim tabs

LED indicator bars for trim tab position

LED indicator bar for gain setting

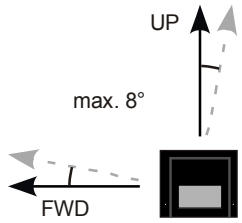
Auto / Manual mode

The Auto button is used to select the mode of the ACS. Briefly pressing the auto button causes the ACS to switch between the manual and automatic mode. In the manual mode, the buttons can be used to control the attitude of the boat manually.

In the automatic mode, the attitude of the boat is controlled automatically when the indicator is lit up. If it is blinking, automatic operation is suspended while the boat is turning sharply or when it is off the plane.

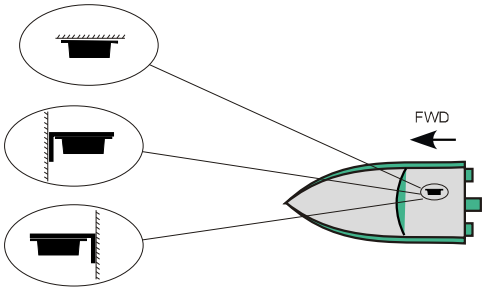
Installation

Control unit



The control unit should be mounted in an upright position. The label on the front side is marked with an UP arrow that should point upwards and a FWD arrow that should point in the forward direction. Exact mounting is not critical, however, as the desired running attitude is set after installation.

The control unit may be installed anywhere in the boat where the high current cables from the trim tabs are easily accessible. It should, however, not be immersed in water.



If there is no wall aligned fore to aft, on which the box can be mounted directly, use the mounting bracket. The mounting bracket has four sets of screw holes. One set for use when the bracket is floor mounted, another when roof mounted and two sets when wall mounted.

Control Panel

Choose a location close to the helm, where the control panel is easy to access and drill holes for the screws and connectors using the enclosed drill pattern. In retrofit installations, remove the old panel and use the new panel to cover the hole.

Connection

IMPORTANT! In retrofit installations, disconnect the wires from the old control panel before connecting the ACS. It should not be connected in parallel with the old panel. Switch off the main circuit breaker before starting the connection!

Connect the red wire to the boat’s main circuit breaker through a fuse. Connect the black wire to the battery's negative (-) terminal. Minimum 2.5 mm2 (14 AWG) is recommended.

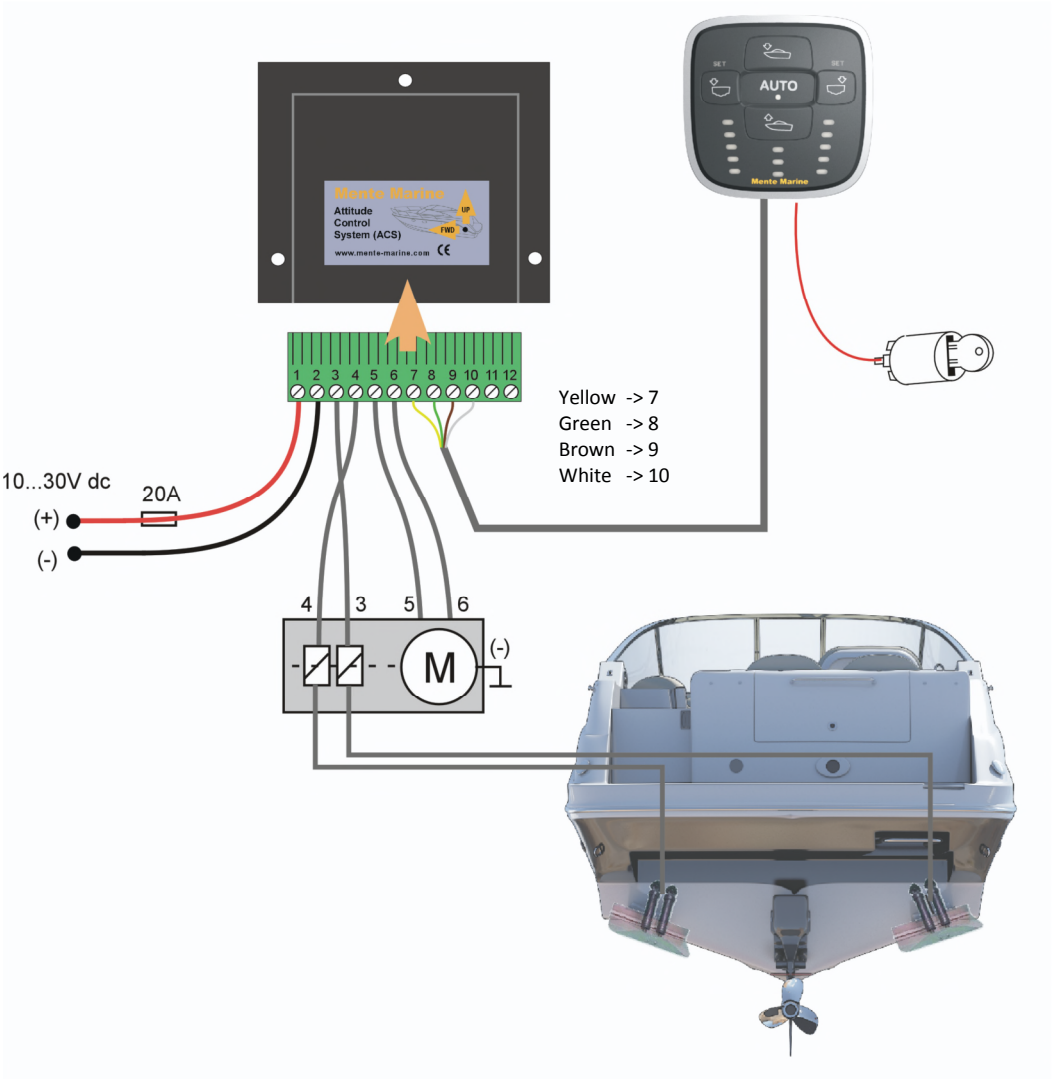
The red wire from the control panel is connected to the ignition key run position. No current is drawn from that wire, it is just a start and retract signal for the ACS.

Hydraulic trim tabs

Hydraulic trim tabs, such as Bennett, Instatrim, QL and Trimmaster use a hydraulic pump unit to extend and retract the actuators. The pump unit is situated in the rear of the boat and connected to the battery's negative (-) terminal. From the pump unit, a wire harness is routed to the ACS. Connect the wires to the ACS terminals 3, 4, 5, 6, according to the figure that follows. Terminals 5 and 6 are connected to the pump's motor and terminals 3 and 4 to the valves controlling the trim tabs.

The table below shows the colours used by the major manufacturers of hydraulic trim tabs. Corresponding ACS markings are shown in the left column.

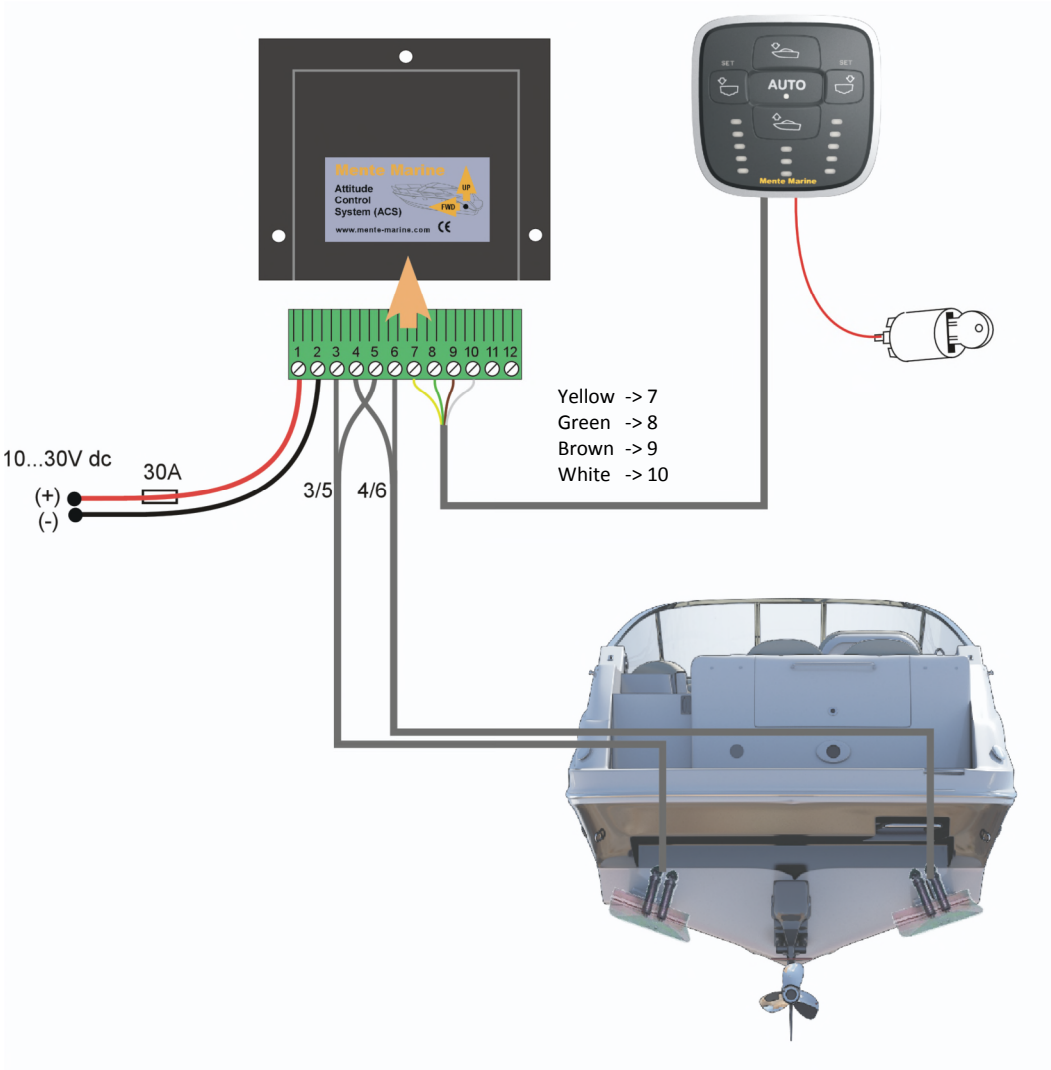
ACS marking	Instatrim (QL)	Bennett	Trim-master
3	White	Green	White
4	Green	Red	Green
5	Yellow	Yellow	Yellow
6	Red	Blue	Red



Electromechanical trim tabs

Connect the starboard actuator to terminals 4 and 6 and the port actuator to terminals 3 and 5, according to the figure that follows. Verify the connection later on and change it if necessary.

ACS marking	Lenco	Lectrotab	Ultraflex
3	Black (port)	White (port)	Black (port)
4	Black (stbd)	White (stbd)	Black (stbd)
5	White (port)	Black (port)	White (port)
6	White (stbd)	Black (stbd)	White (stbd)



Calibration

For the ACS to operate properly, it needs to know the trim tab type, position, and current consumption. This information is automatically acquired and stored in memory during calibration. Before you start, ensure that no obstacles hinder the free run of the tabs.

The AUTO indicator blinks to indicate that calibration is needed. Press the uppermost and lowermost buttons simultaneously for 4 s to start the calibration. Keep the buttons depressed for another 8 s, while the ACS is calibrating.

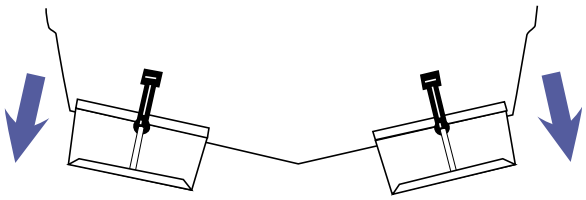
The ACS will now run the trim tabs to their uppermost position. The tabs are then run downwards and back up again.

This calibration may take up to 60 seconds and should not be interrupted. After completion, the indicator LED’s stop blinking. The port trim tab position is now shown by the left bar and the starboard by the right bar.

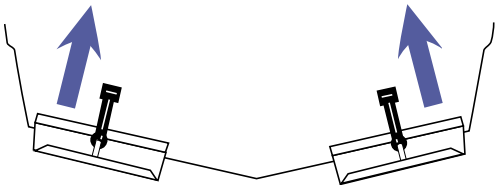
Verify connection

IMPORTANT! After calibration, verify the connection by pressing the buttons one by one and observing the trim tabs. Check the actual movement of the tabs at the transom. For the automatics to work properly, the trim tabs have to move in the correct direction when controlling them manually.

The uppermost button controls both tabs downwards.

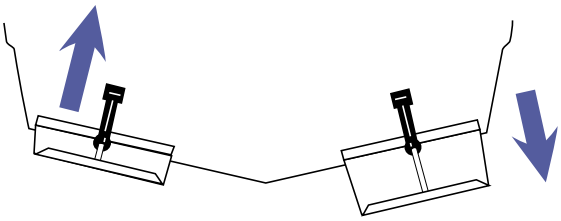


The lowermost button controls both tabs upwards.

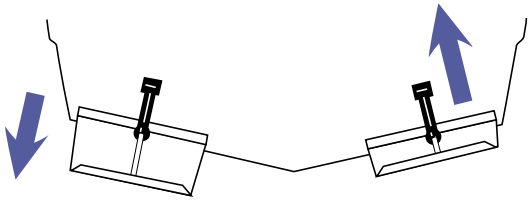


Should the trim tabs move in the wrong direction: For hydraulic trim tabs, exchange the 5 and 6 wires, for electromechanical trim tabs, reverse the wires of the actuator(s) that move in the wrong direction.

The port button controls the port tab upwards first and then the starboard tab downwards.



The starboard button controls the starboard tab upwards first and then the port tab downwards.



Should the trim tabs move in the wrong direction: For hydraulic trim tabs, exchange the 3 and 4 wires, for electromechanical trim tabs, exchange the 3 and 5 wires with the 4 and 6 wires.

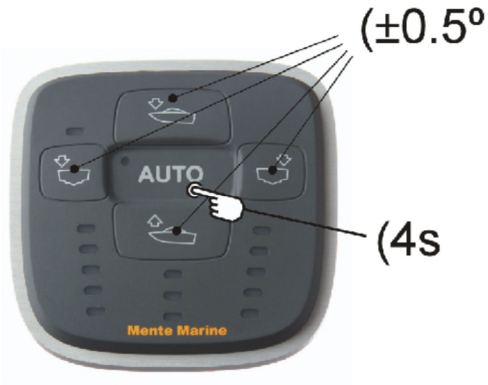
Usage

Attitude setting

Run the boat at cruising speed. Manually control the trim tabs until you find the best attitude. Then, press and hold the auto button for 4 s, until the AUTO indicator is lit up.

Now, the attitude is stored in the memory, and the ACS is set in the automatic mode.

Fine adjustment



In the automatic mode, press any of the four buttons to alter the setting 0.5 degrees in a certain direction. Press more times for a greater change.

Press and hold the auto button for 4 s to store the new setting in the memory.

Now, if the speed is reduced, automatic control is suspended and the AUTO indicator starts to blink. The functionality is then temporarily interrupted to avoid deflecting the tabs at too low a speed.

The automatic mode is re-entered every time you go out, until the ACS is put into manual mode. By pressing the AUTO button, you can toggle between the automatic and manual mode. The running attitude remains in the memory, although the main breakers are switched off.

Adjusting gain

The gain determines how fast the ACS should correct a list condition. It can be adjusted in three steps and the default setting is step I. Step II provides a correction that is a little faster, while step III is the fastest. The setting is optimized, if a list condition is corrected without the boat leaning over to the other side and the trim tabs are not operated too often.

Press the left and right button simultaneously for 4 seconds, until an indicator in the middle starts to blink.

Adjust the gain setting with the uppermost and lowermost buttons. The three indicator LED's in the middle show the setting.

Then, press the left and right buttons again for 4 seconds to store the setting.

Retraction

Retraction prevents fouling of the actuators. ACS automatically retracts the trim tabs and shuts down when the engine is switched off.

Specifications

Compliance (Hydraulic tabs)	Bennett, Instatrim, Trimmaster, QL Volvo Penta, TFX Teleflex, TX Controls
Compliance (Electromechanical tabs)	Lectrotab, Lenco, Eltrim, Ultraflex
Boat length	25...50 feet
Type of control	Control in both the roll and pitch axes
Tab type detection	Automatic
Gain	Automatic, adapts to the boat type
Size (Control panel)	80 * 77.5 * 10 mm
Size (Control unit)	120 * 110 * 40 mm
Protection by enclosure (Control panel)	IP 68
Protection by enclosure (Control unit)	IP 66
Operating temperature	-10...85 °C
Storage temperature	-40...+85 °C
Supply voltage	10...30 V dc
Maximum output current	40 A (When tabs activated)
Current consumption	0.02 A (When idle)
Approvals	CE (Compliance with EMC regulations)

CE

The CE marking assures that this product complies with the requirements of the EC directive for electromagnetic compatibility.

Troubleshooting

If a fault is found, an indicator will start to blink intensively.

Indicators

Trim tabs not found Check the connection!	L1		R1	Wrong installation angle of the control unit
Short-circuit to the positive side	L2		R2	No communication with the control unit
Short-circuit to ground	L3			

Supply voltage

During a fraction of a second, when starting a trim tab motor, the current is much higher than normal and the supply wires, fuseholder and battery should be in a good condition. This is important when replacing mechanical switches with electronic equipment. Check the voltage supply by manually operating the trim tabs. If the supply is weak, the ACS will restart and flash all the indicators twice.

Warranty policy

All ACSs (Attitude Control Systems) purchased through authorized distribution channels are guaranteed against defects of material or workmanship for a period of 24 months from date of purchase. Service will be rendered, and defective parts will be replaced without cost to you within that period, provided that the equipment does not show any evidence of an impact, liquid damage, mishandling, tampering, or chemical corrosion, operation contrary to operating instructions, or modification by an unauthorized repair shop. The manufacturer or its authorized representatives shall not be liable for any repair or alterations, except those made with its written consent and shall not be liable for damages from delay or loss of use or from other indirect or consequential damages of any kind, whether caused by defective material or workmanship or otherwise; and it is expressly agreed that the liability of the manufacturer or its representatives under all guarantees or warranties, whether expressed or implied, is strictly limited to the replacement of parts, as herein before provided. No refunds will be made on repairs performed by non-authorized service facilities.

Procedure during the 24-month warranty period

Any ACS that proves defective during the 24-month warranty period should be returned to the dealer from whom you purchased the equipment or to the manufacturer. If there is no representative of the manufacturer in your country, send the equipment to the manufacturer, with postage prepaid. In this case, it will take a considerable length of time before the equipment can be returned to you, owing to the complicated customs procedures required. If the equipment is covered by warranty, repairs will be made and parts replaced free of charge, and the equipment will be returned to you upon completion of servicing. If the equipment is not covered by warranty, the regular charges of the manufacturer or of its representatives will apply. Shipping charges are to be borne by the owner. If your ACS was purchased outside of the country where you wish to have it serviced during the warranty period, the manufacturer's representatives in that country may charge regular handling and servicing fees. Notwithstanding this, your ACS returned to the manufacturer will be serviced free of charge, according to this procedure and warranty policy.

In any case, however, shipping charges and custom clearance fees are to be borne by the sender. To prove the date of purchase when required, please keep the receipts or bills covering the purchase of your equipment for at least two years. Before sending your equipment for servicing, please make sure you are sending it to the manufacturer's authorized representatives or their approved repair shops, unless you are sending it directly to the manufacturer. Always obtain a quotation for the service charge, and only after you accept the quoted service charge, instruct the service station to proceed with the servicing.

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